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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/666,671	09/17/2003	Hongqin Shi	P118-US	8251
26148	7590	06/01/2006	EXAMINER	
REFLECTIVITY, INC. 350 POTRERO AVENUE SUNNYVALE, CA 94085			VINH, LAN	
			ART UNIT	PAPER NUMBER
			1765	
DATE MAILED: 06/01/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/666,671

Applicant(s)

SHI ET AL.

Examiner

Lan Vinh

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-21,24-30,32-54,56-64 and 66-71 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-3,5-21 and 24-29 is/are allowed.
- 6) ☒ Claim(s) 30,32-54,56-64 and 66-71 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 102404 2 3 106
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment/Argument

1. Applicant's arguments, see page 10 of the response, filed 3/27/2006, with respect to the rejection(s) of claims 1-3, 5-, 10-15 under 35 U.S.C 102(b) as being anticipated by Lebouitz (US 2002/0033229) have been fully considered and are persuasive. The rejection(s) have been withdrawn.

The applicants argue that Lebouitz does not teach or suggest the feature wherein at a first time the etchant recipe is provided at a first amount per unit time, and wherein at a second time the etchant recipe is provided at a second amount per unit time that is a different from the first amount per unit time, as recited expressly in claim 30. This argument is moot in view of the new ground(s) of rejection of claim 30 under 35 U.S.C 102(e) as being anticipated by Outka (US 2002/0179569)

The argument that Lebouitz does not teach or suggest the amount of the etchant being varied when a change of a measured parameter is beyond a predetermined value during the etching (and wherein the amount of the etchant is varied from a first amount to a second amount and wherein both the first and second amount are not 0) as recited expressly in claim 53 is moot in view of the new ground of rejection of claim 53 as set forth below

Applicant's arguments filed 3/27/2006 with respect to the rejection(s) of claim 63 under 35 U.S.C 103(a) as being unpatentable over Lebouitz in view of Winningham have been fully considered but they are not persuasive. The applicants argue that there is no suggestion to combine the references of Lebouitz and Winningham because

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Lebouitz is related to a gas phase silicon etching with XeF₂ while Winningham is related to etching Cr coated bionanomask applied directly to a silicon substrate using H₂ and SF₆ as etchant, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since Winningham is relied only for the teaching of using the etchant recipe based on the collected data of the parameter in the first etching process (col 13, lines 55-58) and the motivation to combine the reference comes from Winningham, one skilled in the art at the time the invention was made would have found it obvious to employ Winningham teaching with Lebouitz method to produce the claimed invention. Thus, the rejection(s) of claims 63-64, 66-71 under 35 U.S.C. 103(a) as being unpatentable over Lebouitz et al (US 2002/0033229A1) in view of Winningham are maintained

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 42-43, 48, 57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claim 42 recites the limitation "the spontaneous vapor phase" in claim 30. There is insufficient antecedent basis for this limitation in the claim.

Claim 48 recites the limitation "the sacrificial materials" in claim 30. There is insufficient antecedent basis for this limitation in the claim.

Claim 57 recite the limitations of "the interhalogen comprises"" in claim 53. There are insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

((e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 30, 32, 34-41, 48-50 are rejected under 35 U.S.C. 102(b) as being anticipated by Outka et al (US 2002/0179569A1)

Outka discloses a method for etching in plasma etch. The method comprises the steps of:

loading a semiconductor sample/microstructure into an etch chamber of the etch system, wherein the sample comprises silicon /sacrificial material and one or more structural materials (page 2, paragraph 0019-0021)

providing a etchant recipe comprising BCl₃/interhalogen to the etch system over time to etch the sample/microstructure (page 2, paragraph 0024)

wherein at a first time the etchant recipe is provided at a first amount per unit time and wherein at a second time the etchant recipe is provided at a second amount per unit time that is different from the first amount per unit time (page 4, paragraph 0042, Table 3)

The limitations of claims 32, 40-41 have been discussed above

Regarding claim 34, table 3 of Outka shows that the first amount 70 sccm of BCl₃ is greater than the second amount of 50 sccm of BCl₃

Regarding claims 35-35, Outka discloses providing a third amount of BCl₃ at a third time, wherein the interval between the first and the second time does not equal the interval between the second time and the third time (Table 4)

Regarding claims 37, 38, 39, Outka discloses measuring the flow rate/concentration of the etchant recipe and providing the second amount of the etchant recipe based on the measured flow rate (Table 4)

Regarding claims 48-50, Outka discloses that the aluminum layer /structural layer remains in the wafer/microstructure after the silicon dioxide is etched/removed (page 2, paragraph 0021; page 3, paragraph 0027)

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6.. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Outka et al (US 2002/0179569A1) in view of Zhang et al (US 6,162,585)

Outka method has been described above. Unlike the instant claimed invention as per claim 33, Outka fails to disclose providing a first amount of the etchant, wherein the first amount equals the second amount

Zhang discloses a method for etching comprises the steps of providing a first amount of the etchant recipe at a first time; providing a second amount of the etchant recipe at a second time, wherein the first amount equals the second amount (col 5, lines 20-27)

One skilled in the art at the time the invention was made would have found it obvious to modify Outka method by varying the amount of the etchant in Outka to obtain the specific amounts as per Zhang in order to achieved desired etch depth as taught by Zhang (col 5, lines 49-52)

7. Claims 42-45 rejected under 35 U.S.C. 103(a) as being unpatentable over Outka et al (US 2002/0179569A1) in view of Lebouitz et al (US 2002/0033229A1)

Outka method has been described above. Unlike the instant claimed invention as per claims 42-45, Outka fails to disclose using vapor phase xenon difluoride and an inert gas in the etchant recipe

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Lebouitz discloses a method for etching semiconductor sample comprises a step of providing a spontaneous vapor phase of xenon difluoride/noble gas halide and an inert gas to etch a semiconductor sample (page 3, paragraph 0042; page 4, paragraph 0038)

One skilled in the art at the time the invention was made would have found it obvious to modify Outka method by providing a vapor phase xenon difluoride and an inert gas in the etchant recipe as per Lebouitz because Lebouitz discloses that the etching speed is increased as xenon difluoride and inert gas are forced into the chamber (page 5, paragraph 0042)

8. Claims 46-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Outka et al (US 2002/0179569A1) in view of Lebouitz et al (US 2002/0033229A1) and further in view of Han et al (US 6,740,247)

Outka as modified by Lebouitz has been described above. Unlike the instant claimed inventions as per claims 46-47, Outka and Lebouitz fails to disclose that the diluent gas has a partial pressure from 20-700 Torr

Han discloses a method for HF vapor cleaning/etching comprises the step using a nitrogen /diluent gas has a partial pressure from 10-500 Torr (col 7, lines 55-57)

One skilled in the art at the time the invention was made would have found it obvious to modify Outka and Lebouitz method by using a nitrogen/diluent gas has a partial pressure of 10-500 Torr to enable stabilization of the operating chamber pressure as taught by Han (col 7, lines 55-58)

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9. Claims 51-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Outka et al (US 2002/0179569A1) in view of Chen et al (US 6,159,851)

Outka method has been described above. Unlike the instant claimed invention as per claims 51-52, Outka fails to disclose that the structural material comprises a elemental metal and a metal nitride

Chen discloses a method for forming a semiconductor device comprises the step of forming a TiN layer with a primary conductive layer (col 6, lines 4-6)

Thus, one skilled in the art at the time the invention was made would have found it obvious to modify Outka method by forming a metal nitride as per Chen because Chen discloses that the TiN provides conformal adherent coating on a lower metal (col 5, lines 14-16)

10. Claims 53-54, 56, 58-59, 61-62 are rejected being unpatentable over Lebouitz et al (US 2002/0033229A1) in view of Outka et al (US 2002/0179569A1)

Lebouitz discloses a method for etching semiconductor sample. The method comprises the steps of:

providing a spontaneous vapor phase of xenon difluoride/noble gas halide to the etch system over time to etch the sample/microstructure (page 4, paragraph 0038), the amount of the etchant varies per time unit during etching (page 6, paragraph 0054)

Unlike the instant claimed invention as per claim 53, Lebouitz fails to disclose that wherein the amount of the etchant recipe varies from a first amount to a second amount and wherein both the first and second amount are not zero

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Outka discloses a method for etching in plasma etch comprises a step of providing an etch recipe comprise wherein at a first time the etchant recipe is provided at a first amount per unit time and wherein at a second time the etchant recipe is provided at a second amount per unit time that is different from the first amount and wherein both amount are not zero (page 4, paragraph 0042, Table 3)

Thus, one skilled in the art at the time the invention was made would have found it obvious to modify Lebouitz method by varying the first and the second amount in the etchant recipe in view of Outka teaching because Outka discloses that the deposits in the plasma chamber can be reduced by controlling the amount of the etchant used on the main etch (abstract)

Regarding claim 54, Lebouitz discloses choosing the system parameter of the etching system using the gas flow rate/concentration, etch time (col 4, paragraph 0038)

The limitations of claims 56, 58-59 have been discussed above

Regarding claims 61-62, Lebouitz discloses introducing nitrogen/diluent into the chamber (col 4, paragraph 0038)

11. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lebouitz et al (US 2002/0033229A1) in view of Outka et al (US 2002/0179569A1) and further in view of Tai et al (US 6,436,229)

Lebouitz as modified by Outka has been described above. Unlike the instant claimed invention as per claim 57, Lebouitz and Outka fails to disclose using BrF₃ as a vapor etchant

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Tai discloses a method for etching comprises the step of etching silicon using BrF₃ (col 3, lines 10-15)

One skilled in the art at the time the invention was made would have found it obvious to substitute Lebouitz and Outka xenon difluoride vapor etchant with BrF₃ as per Tai because Tai discloses that BrF₃ has higher etching efficiency than that of xenon difluoride and BrF₃ is also cost effective when compared with the use of xenon difluoride (col 3, lines 5-10)

12. Claim 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lebouitz et al (US 2002/0033229A1) in view of Outka et al (US 2002/0179569A1) and further in view of Zhang et al (US 6,162,585)

Lebouitz as modified by Outka has been described above. Unlike the instant claimed inventions as per claim 60, Lebouitz and Outka disclose using a vapor etchant recipe comprises of xenon difluoride instead of HF

Zhang discloses a method for etching using vapor HF (col 5, lines 39-40)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Lebouitz and Outka method by using vapor HF etching as per Zhang because Zhang discloses that the allowable duration of vapor HF etching allows deeper etch (col 5, lines 63-67)

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13. Claims 63-64, 66, 68-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lebouitz et al (US 2002/0033229A1) in view of Winningham et al (US 6,518,194)

Lebouitz discloses a method for etching semiconductor sample/microstructure. The method comprises the steps of: collecting a plurality of data of flow rate/concentration of the etchant/ parameter during a first etching for first series of sample/first microstructure using an spontaneous vapor phase etchant recipe of xenon difluoride, determining a variation profile of the parameter in the first etch process (col 6, paragraph 0054). Lebouitz also discloses producing an etch by-product (col 6, paragraph 0052)

Unlike the instant claimed invention as per claim 63, Lebouitz fails to specifically disclose the step of etching a second microstructure in a second etching process using the etchant recipe based on the collected data of the parameter in the first etching process

Winningham discloses a method for transferring nanoscale pattern comprises the step of etching a second sample/microstructure in a second etching process using the etchant recipe based on the collected data of the parameter in the first etching process (col 13, lines 55-58)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Lebouitz method by etching a second sample/microstructure in a second etching process using the etchant recipe based on the collected data of the parameter in the first etching process in order to determine the time needed to etch through the sample as taught by Winningham (col 12, lines 52-55)

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The limitations of claims 64, 66 have been discussed above

Regarding claims 68-69, Tai discloses using xenon difluoride (col 9, lines 32-33)

Regarding claims 70-71, Lebouitz discloses introducing nitrogen/diluent into the chamber (col 4, paragraph 0038)

14. Claim 67 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lebouitz et al (US 2002/0033229A1) in view of Winningham et al (US 6,518,194) and further in view of Tai et al (US 6,436,229)

Lebouitz as modified by Winningham has been described above. Unlike the instant claimed invention as per claim 67, Lebouitz and Winningham fail to disclose using BrF₃ as a vapor etchant

Tai discloses a method for etching comprises the step of etching silicon using BrF₃ (col 3, lines 10-15)

One skilled in the art at the time the invention was made would have found it obvious to substitute Lebouitz and Winningham xenon difluoride vapor etchant with BrF₃ as per Tai because Tai discloses that BrF₃ has higher etching efficiency than that of xenon difluoride and BrF₃ is also cost effective when compared with the use of xenon difluoride (col 3, lines 5-10)

Allowable Subject Matter

15. Claims 1-3, 5-21, 24-29 allowed.

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The following is an examiner's statement of reasons for allowance: Reason for allowance of claim 1 has been discussed in paragraph 1 of this office action

16. Applicant's amendment necessitated the new ground(s) of rejection of independent claims 30, 53 presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to be 'LV' followed by a stylized flourish.

LV

May 29, 2006